

[Home](#) \* [People](#) \* **Bill Gosper**



Bill Gosper 2006 <sup>[5]</sup>

**Ralph William (Bill) Gosper, Jr.**, an American mathematician and computer scientist, along with [Richard Greenblatt](#) considered the co-founder of the [hacker](#) community <sup>[1]</sup>.

In the 60s, affiliated with [MIT](#), he worked for [Project MAC](#) (Machine-Aided Cognition), where his contributions to [computational mathematics](#) and [Bit-Twiddling](#) include [HAKMEM](#) and [Macclisp](#). He helped Greenblatt with his chess program [Mac Hack VI](#), and operated the [PDP-6](#) when [Robert Q](#) played its first tournament game versus Carl Wagner.

In the 70s, Bill Gosper moved to [Stanford University](#) for some years, where he lectured and helped [Donald Knuth](#) to write volume II of [The Art of Computer Programming](#). He has worked at or consulted for [Xerox PARC](#), [Symbolics](#), [Wolfram Research](#), the [Lawrence Livermore National Laboratory](#), and [Macsyma](#) <sup>[2]</sup>. Bill Gosper created numerous [packing problem](#) puzzles such as the Twubblesome Twelve <sup>[3]</sup>, and was interested in the [Conway's Game of Life](#), where he found the [Glider Gun](#) and originated the [Hashlife](#) algorithm to speed up the computation of Life patterns <sup>[4]</sup>.

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## Robert Q



[Allen Moulton](#) and [R. William Gosper](#) operating "[Robert Q](#)" on a [PDP-6](#) <sup>[6]</sup> <sup>[7]</sup>

## HAKMEM

[HAKMEM](#), alternatively known as [AI Memo 239](#), is a February 1972 "memo" (technical report) of the [MIT AI Lab](#) by [Gosper](#) et al. that describes a wide variety of [hacks](#), primarily useful and clever [algorithms](#), and even a chess position <sup>[9]</sup> <sup>[10]</sup>. A few samples, referred elsewhere:

## HAKMEM 70

HAKMEM 70 [\[11\]](#), A neat chess problem, swiped from *Chess for Fun and Chess for Blood*, by [Edward Lasker](#) [\[12\]](#). White mates in three moves:

5B2/6P1/1p6/8/1N6/kP6/2K5/8 w - -

## HAKMEM 169

[HAKMEM 169](#), to [count the ones](#) in a [PDP-6/PDP-10](#) 36-bit word, written in [Assembly](#) [\[13\]](#) [\[14\]](#):

```
LDB    B,[014300,,A]      ;or MOVE B,A then LSH B,-1
AND    B,[333333,,333333]
SUB     A,B
LSH     B,-1
AND    B,[333333,,333333]
SUBB    A,B                ;each octal digit is replaced by number of
1's in it
LSH     B,-3
ADD     A,B
AND     A,[070707,,070707]
IDIVI   A,77               ;casting out 63.'s
```

## HAKMEM 175

[HAKMEM 175](#) - next higher number with the same number of one bits (Snoob), by [Bill Gosper](#), [PDP-6 Assembly](#) [\[15\]](#):

```
MOVE    B,A
MOVN    C,B
AND     C,B
ADD     A,C
MOVE    D,A
XOR     D,B
LSH     D,-2
IDIVM   D,C
```

IOR    A, C

## Gosper's Glider Gun



Gosper's [Glider Gun](#) in action — a variation of [Conway's Game of Life](#) <sup>[16]</sup>

## See also

- [Bit-Twiddling](#)
- [Mac Hack VI](#)
- [PDP-6](#)
- [Traversing Subsets of a Set](#)

## Selected Publications

- Michael Beeler, [Bill Gosper](#), [Rich Schroepel](#) (1972). [HAKMEM](#), Memo 239, Artificial Intelligence Laboratory, [Massachusetts Institute of Technology](#) <sup>[17]</sup>
- [Bill Gosper](#) (1977). *Decision procedure for indefinite hypergeometric summation*. Proc. Natl. Acad. Sci. USA, Vol. 75, No. 1, [pdf](#) <sup>[18]</sup>

## External Links

- [Bill Gosper from Wikipedia](#)
- [Twubblesome Twelve - a difficult puzzle](#) by [Bill Gosper](#)
- [Rep-tiles](#) by [Bill Gosper](#)
- [HAKMEM from Wikipedia](#)
- [HAKMEMC -- HAKMEM Programming hacks in C](#) by [Alan Mycroft](#)
- [Gosper's algorithm from Wikipedia](#)
- [Gosper curve from Wikipedia](#)
- [Hashlife from Wikipedia](#) by [Bill Gosper](#)

## References

1. [^ Hackers: Heroes of the Computer Revolution](#)
2. [^ Bill Gosper from Wikipedia](#)
3. [^ Twubblesome Twelve - a difficult puzzle](#) by [Bill Gosper](#)
4. [^ Gosper's Algorithm \(Hashlife\) explained](#)
5. [^](#) Mathematician Bill Gosper in March, 2006 at the [Seventh Gathering for Gardner](#) (G4G7) in [Atlanta, Georgia](#), 16 March 2006, Photographer [Thane Plambeck](#)
6. [^ MIT Computer Loses to Human in Chess](#). [Sun Journal \(Lewiston\)](#), January 23, 1967, [Google News](#)
7. [^ AP :: Images :: Search Results :: Carl Wagner, 1967, MIT Chess](#)
8. [^ HAKMEM from Wikipedia](#)
9. [^](#) Michael Beeler, [Bill Gosper](#), [Rich Schroepel](#) (1972). [HAKMEM](#), Memo 239, Artificial Intelligence Laboratory, [Massachusetts Institute of Technology](#)
10. [^ HAKMEMC -- HAKMEM Programming hacks in C](#) by [Alan Mycroft](#)
11. [^ HAKMEM - GAMES: ITEM 70](#)
12. [^ Edward Lasker \(1942,1962\) Chess for Fun and Chess for Blood](#). Dover Publications; 2 edition, ISBN-13: 978-0486201467, [amazon](#)
13. [^ HAKMEM 169](#) by [Gosper](#), Mann, Lenard, [Root and Mann], [HAKMEM](#)
14. [^ PDP-10 Machine Language](#)
15. [^ HAKMEM 175](#) by [Bill Gosper](#)
16. [^](#) Bill Gosper's [Glider Gun](#) in action — a variation of [Conway's Game of Life](#). This image was made by using [Life32 v2.15 beta](#) by Johan G. Bontes, 2005, [Gun \(cellular automaton\) from Wikipedia](#)
17. [^](#) Web-available by [Henry Baker](#)
18. [^ Gosper's algorithm from Wikipedia](#)

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